Space Weather Technical Forecast

Issued on Friday, 21 October 2022 at 01:15 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity over the past 24 hours has been Low, with occasional low level C-class flares, the largest a C5 flare at 20/1653 UTC from AR3122 (which has now rotated off the disc). There are currently three sunspot regions on the visible disc. AR3126 is the largest, though remains stable. There are two unnumbered sunspot regions, one in the northeast, and a second in the southeast, both are small and simple. No Earth directed CMEs were visible on available satellite imagery.

Solar Wind / Geomagnetic Activity: The solar wind, as observed by DSCOVR at L1, has been slightly elevated, between 410 and 480 km/s. The density was near to below average. The total IMF strength, Bt, was weak below 7nT, with the north-south component, Bz, varying weakly between +5/-5 nT. The phi angle was negative (towards the Sun) throughout. Geomagnetic activity was Quiet (Kp 0-2) throughout the period.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured at GOES-16 has remained at background levels. High energy electron flux (greater than 2MeV) at GOES-16 was mostly Moderate, but briefly reached High levels, with a peak flux of 1290 pfu recorded at 20/1425 UTC. The associated fluence was below the Active (1e8 integrated pfu) threshold on a generally flat trend, with 3.45e7 integrated pfu observed at 21/0001 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is most likely to continue Low, with a slight chance of an isolated M-flare.

Solar Wind / Geomagnetic Activity: There are currently no Earth-directed CMEs expected. Solar winds near background levels may experience a slight enhancement through day 1 (21 Oct) due to any residual fast wind from the now closed CH33/+. A further enhancement is possible towards the end of the period due to the influence of CH34/-, although this is low confidence. Geomagnetic activity is expected to be mainly Quiet, occasionally Unsettled, day 1 (21 Oct), perhaps with a slight chance of isolated Active intervals. There is a chance of activity increasing to Unsettled to Active, with a slight chance of isolated G1/Minor Storm intervals, by the end of the period.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10MeV) is expected to be at background levels. High energy electron flux (greater than 2MeV) as observed by GOES-16 is expected to remain mainly at Background to Moderate levels. 24 hour Fluence levels are expected to remain below the Active (1e8 integrated pfu) threshold.

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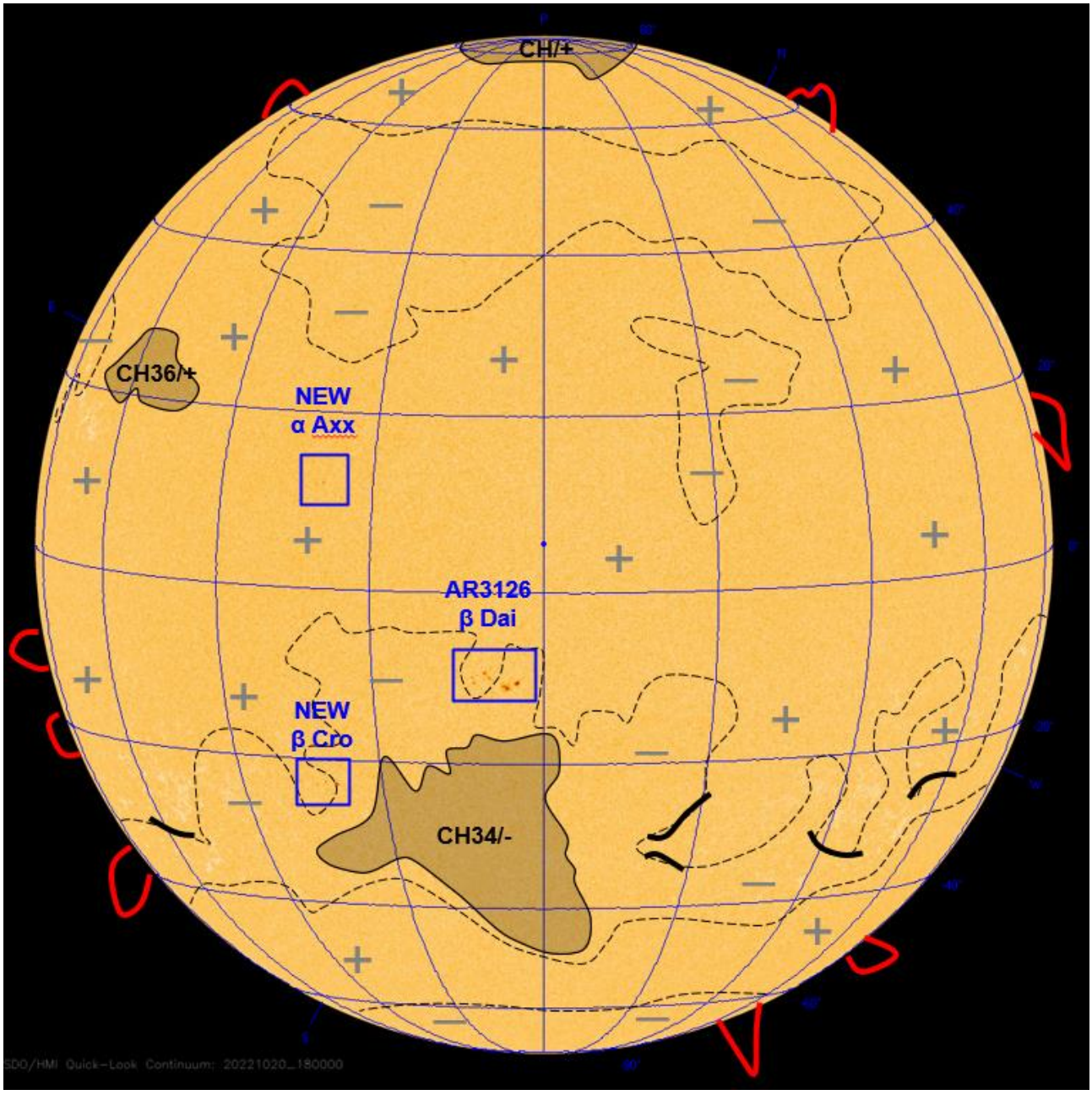
Figure 1. Solar Analysis Valid 20/1800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are currently no Earth-directed CMEs expected.

Solar winds are expected to decrease further to near background levels following the recent fast wind enhancement from CH32/-. The next potential enhancement could come from a small and now closed coronal hole (CH33/+). This coronal hole was much smaller than on the previous rotation, and is now impossible distinguish. However, this was present in the central disc on the 17th, perhaps bringing a weak enhancement on day 1 (21 Oct) with solar winds perhaps rising to around 450-500 km/s. Later day 2 (22nd), Enlil suggests a more significant enhancement arriving from southern disc coronal hole CH34/-. This is low confidence, however as whilst the coronal hole is larger and more distinct on this rotation, solar wind persistence would suggest the arrival of any fast wind enhancement isn't expected until the 24th.

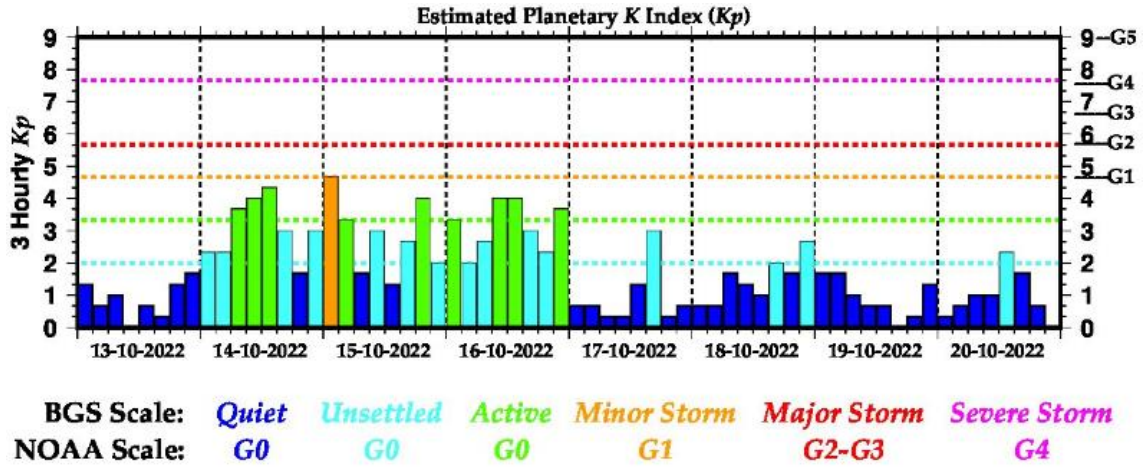
Geomagnetic activity is expected to be mainly Quiet, occasionally Unsettled, day 1 (21 Oct), perhaps with a slight chance of isolated Active intervals. There is then a chance of activity increasing to Unsettled to Active, with a slight chance of isolated G1/Minor Storm intervals, by day 4 (24 Oct), if we see any influence from CH34/-.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	5	10
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil.

Figure 2: BGS planetary K index – Quiet.



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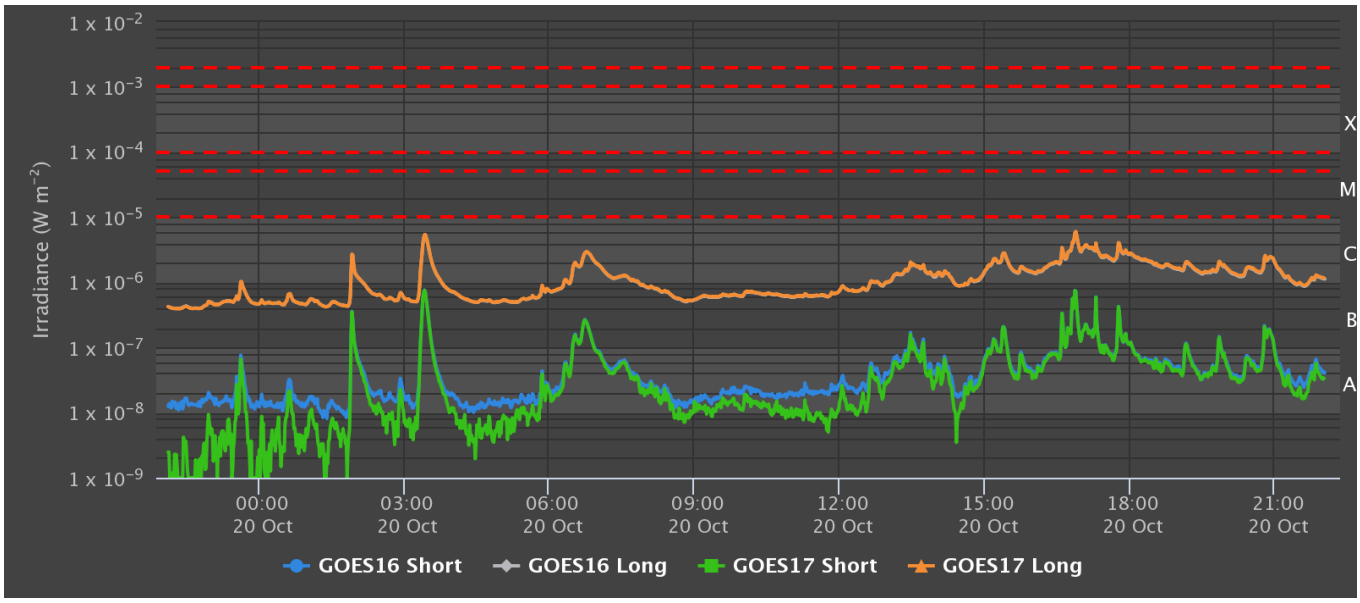
Radio Blackouts - X-Ray Flares:
Solar activity over the past 24 hours has been Low, with occasional low level C-class flares, the largest a C6 flare at 20/1652 UTC from AR3122, which has now rotated off the northwest limb, but could still produce further C-class flares from behind the limb for the next day or so. There are currently three sunspots on the visible disc. The largest is AR3126, which has a Dai/Beta configuration, although appears to be stable, with some slight decay of its intermediate spots. There are also two unnumbered sunspots on the disc, with both of these small and simple, with no signs of activity.

More recently, there has been some minor C-class flares originating from a large area of plage in the southwest quadrant, although currently no signs of any emerging sunspot regions.
Solar activity is most likely to continue Low, with a slight chance of an isolated M-flare.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	15	10	10	10
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: GOES-16 X-Ray flares



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Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as observed by GOES16 is currently at background levels and is expected to remain at this level.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) as observed by GOES-16 has exhibited a diurnal variation between Low and Moderate levels on a day-by-day basis. However, flux briefly reached High levels, with a peak of 1290 pfu recorded at 20/1425 UTC.

Solar winds are gradually easing to near background levels. Peak flux levels are not expected to significantly rise again until beyond this period, and potentially suppressed to background should any fast winds from CH34/- materialise by days 3 and 4 (23-24 Oct).

The associated 24 hour electron fluence is expected to remain below the Active threshold (1e8), with REFM considered to be giving a good forecast trend.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ 2 MeV ≥ $1x10^8$	No	1	1	1	1
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

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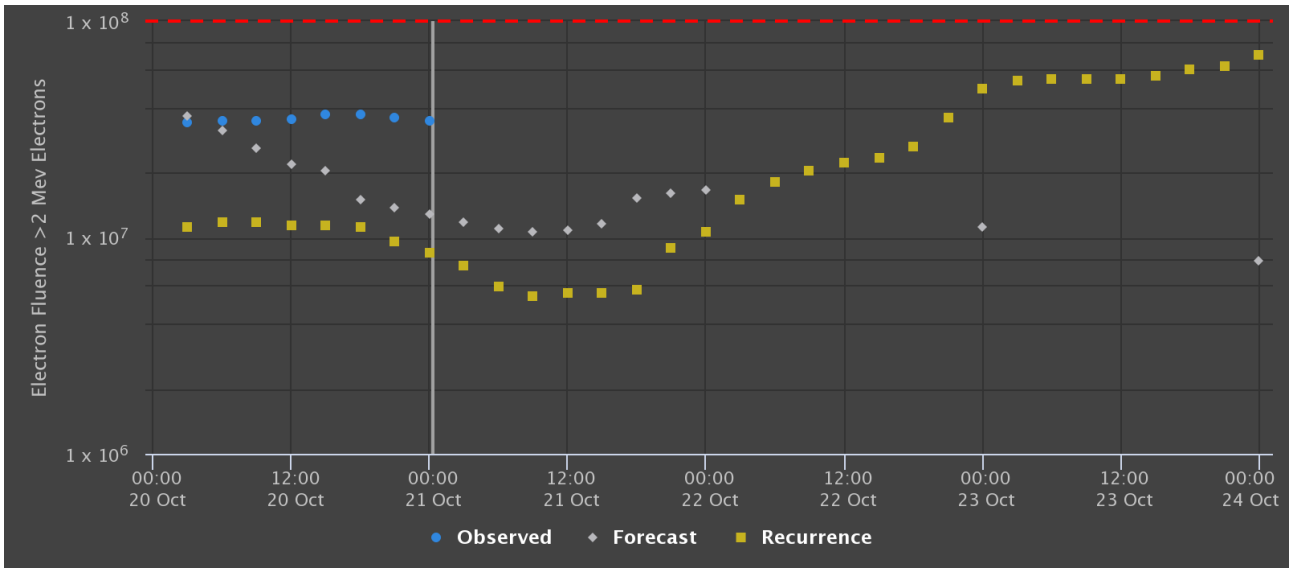
Figure 4: MOSWOC REFM – electron fluence



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